

WHAT IS CLAIMED IS:

1. A storage system comprising:

5 a cache configured to store a plurality of data blocks in a first plurality of locations, wherein said cache is a non-volatile storage;

a first metadata storage including a plurality of entries configured to store metadata including block addresses of data blocks within said

10 cache, wherein said first metadata storage is a non-volatile storage; and

a second metadata storage including a second plurality of locations each configured to store metadata including a block address identifying

15 a corresponding data block within said cache and further including a first pointer to said corresponding data block within said cache, wherein said second metadata storage is a volatile storage;

wherein at least one of said second plurality of locations is further

20 configured to store a second pointer to another of said second plurality of locations that stores metadata corresponding to a related data block.

2. The storage system as recited in claim 1 further comprising cache control logic

25 coupled to said cache and configured to update said first metadata and said second metadata.

3. The storage system as recited in claim 1, wherein each entry of said plurality of entries corresponds to a respective one of said plurality of locations in said cache.
4. The storage system as recited in claim 1, wherein each of said second plurality of locations is configured to store metadata corresponding to any of said plurality of locations in said cache storage.
5. The storage system as recited in claim 1, wherein said metadata includes a value indicative of whether a corresponding data block contains valid data.
- 10 6. The storage system as recited in claim 1, wherein said metadata includes a value indicative of whether a corresponding data block has been flushed to an underlying storage volume.
- 15 7. The storage system as recited in claim 1, wherein said metadata includes a value corresponding to a volume identifier of an underlying storage volume.
8. The storage system as recited in claim 1, wherein said metadata stored within the second metadata storage is arranged into one or more cache descriptors each associated with a respective data block.
- 20 9. The storage system as recited in claim 8, wherein said one or more cache descriptors are arranged into one or more groups, wherein a given group includes one or more cache descriptors that correspond to contiguous logical block addresses of an underlying storage volume.
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10. The storage system as recited in claim 1, wherein said related data block is new data having a particular block address and said corresponding data block is old data having said particular block address.
- 5 11. The storage system as recited in claim 1, wherein said another of said second plurality of locations stores a third pointer to an additional one of said second plurality of locations that stores metadata corresponding to an additional related data block.
12. The storage system as recited in claim 11, wherein said additional related data
10 block is data corresponding to the result of an Exclusive OR operation between said corresponding data block and said related data block.
13. The storage system as recited in claim 1, wherein said metadata stored within said
15 second metadata storage further includes values indicative of the types of data blocks pointed to by said pointers.
14. The storage system as recited in claim 1, wherein said storage system further
20 comprising a storage for storing data including said plurality of data blocks cached within said cache.
15. The storage system as recited in claim 10 further comprising a controller unit coupled between said storage and said cache and configured to control storage of said data within said storage.
- 25 16. The storage system as recited in claim 10, wherein said storage includes a storage volume including at least one physical storage device.

17. The storage system as recited in claim 16, wherein said at least one physical storage device includes one or more hard disk drives.

18. A method comprising:

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storing a plurality of data blocks in a first plurality of locations of a cache,
wherein said cache is a non-volatile storage;

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storing within a non-volatile first metadata storage including a plurality of entries,
metadata including block addresses of data blocks within said cache;

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storing within each of a second plurality of locations of a volatile second metadata
storage, metadata including a block address identifying a corresponding
data block within said cache and further including a first pointer to said
corresponding data block within said cache; and

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storing within at least one of said second plurality of locations, a second pointer to
another of said second plurality of locations that stores metadata
corresponding to a related data block.

19. The method as recited in claim 18, wherein each entry of said plurality of entries corresponds to a respective one of said plurality of locations in said cache.

20. The method as recited in claim 18 further comprising storing within each of said
25 second plurality of locations, metadata corresponding to any of said plurality of locations
in said cache storage.

21. The method as recited in claim 18, wherein said metadata includes a value indicative of whether a corresponding data block contains valid data.

22. The method as recited in claim 18, wherein said metadata includes a value
5 indicative of whether a corresponding data block has been flushed to an underlying storage volume.

23. The method as recited in claim 18, wherein said metadata includes a value corresponding to a volume identifier of an underlying storage volume.

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24. The method as recited in claim 18 further comprising arranging said metadata stored within said second metadata storage into one or more cache descriptors each associated with a respective data block.

15 25. The method as recited in claim 24 further comprising arranging said one or more cache descriptors are into one or more groups, wherein a given group includes one or more cache descriptors that correspond to contiguous logical block addresses of an underlying storage volume.

20 26. The method as recited in claim 18, wherein said related data block is new data having a particular block address and said corresponding data block is old data having said particular block address.

27. The method as recited in claim 18 further comprising storing within said another
25 location of said second plurality of locations, a third pointer to an additional one of said second plurality of locations that stores metadata corresponding to an additional related data block.

28. The method as recited in claim 27, wherein said additional related data block is data corresponding to the result of an Exclusive OR operation between said corresponding data block and said related data block.

- 5 29. The method as recited in claim 18, wherein said metadata stored within said second metadata storage further includes values indicative of the types of data blocks pointed to by said pointers.